

Claim Amendments

Please make the following amendments to the claims:

1. (Canceled).
2. (Currently amended) The ~~substrate~~metallic component of claim ~~[[+]]105~~ wherein X is F.
3. (Currently amended) The ~~substrate~~metallic component of claim ~~[[+]]105~~ wherein X is S.
4. (Currently amended) The ~~substrate~~metallic component of claim ~~[[+]]105~~ wherein said gradient further comprises chromium carbide molecules.
5. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]103~~ wherein said gradient further comprises chromium carbide molecules.
6. (Currently amended) The ~~substrate~~metallic component of claim ~~[[3]]102~~ wherein said gradient further comprises chromium carbide molecules.
7. (Currently amended) The ~~substrate~~metallic component of claim ~~[[+]]105~~ comprising chromium-X molecules to a depth of 50 nm or more from the outer surface of said metallic substrate.
8. (Currently amended) The ~~substrate~~metallic component of claim ~~[[+]]105~~ comprising chromium-X molecules to a depth of 150 nm or more from the outer surface of said metallic substrate.
9. (Currently amended) The ~~substrate~~metallic component of claim ~~[[+]]105~~ comprising chromium-X molecules to a depth of 250 nm or more from the outer surface of said metallic substrate.
10. (Currently amended) The ~~substrate~~metallic component of claim ~~[[+]]105~~ having a final hardness of about 15 GPa or more.
11. (Currently amended) The ~~substrate~~metallic component of claim ~~[[+]]105~~ having a final hardness of about 20 GPa or more.
12. (Currently amended) The ~~substrate~~metallic component of claim ~~[[+]]105~~ having a final hardness of about 25 GPa or more.

13. (Currently amended) The substrate~~metallic component~~ of claim ~~[[4]]~~105 wherein said final coefficient of friction is about 0.3 or less.

14. (Currently amended) The substrate~~metallic component~~ of claim ~~[[4]]~~105 wherein said final coefficient of friction is about 0.2 or less.

15. (Currently amended) The substrate~~metallic component~~ of claim ~~[[4]]~~105 wherein said final coefficient of friction is about 0.1 or less.

16. (Currently amended) The substrate~~metallic component~~ of claim 10 wherein said final coefficient of friction is about 0.3 or less.

17. (Currently amended) The substrate~~metallic component~~ of claim 10 wherein said final coefficient of friction is about 0.2 or less.

18. (Currently amended) The substrate~~metallic component~~ of claim 10 wherein said final coefficient of friction is about 0.1 or less.

19. (Currently amended) The substrate~~metallic component~~ of claim 11 wherein said final coefficient of friction is about 0.3 or less.

20. (Currently amended) The substrate~~metallic component~~ of claim 11 wherein said final coefficient of friction is about 0.2 or less.

21. (Currently amended) The substrate~~metallic component~~ of claim 11 wherein said final coefficient of friction is about 0.1 or less.

22. (Currently amended) The substrate~~metallic component~~ of claim 12 wherein said final coefficient of friction is about 0.3 or less.

23. (Currently amended) The substrate~~metallic component~~ of claim 12 wherein said final coefficient of friction is about 0.2 or less.

24. (Currently amended) The substrate~~metallic component~~ of claim 12 wherein said final coefficient of friction is about 0.1 or less.

25. (Currently amended). The substrate~~metallic component~~ of claim ~~[[4]]~~105 wherein said substrate~~outer surface~~ comprises a chromium content ~~and said sufficient quantity comprises from about 10 atomic % to about 40 atomic % oxygen~~X in relation to the chromium content.

26. (Currently amended) The ~~substrate~~metallic component of claim ~~[[1]]105~~ wherein said ~~substrate~~outer surface comprises a chromium content and ~~sufficient quantity~~comprises about 25 atomic % X in relation to the chromium content.

27. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]101~~ comprising ~~chromium-fluorine~~chromium-F molecules to a depth of 50 nm or more from the outer surface of said ~~metallic component~~substrate.

28. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]101~~ comprising ~~chromium-fluorine~~chromium-F molecules to a depth of 150 nm or more from the outer surface of said ~~metallic component~~substrate.

29. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]101~~ comprising ~~chromium-fluorine~~chromium-F molecules to a depth of 250 nm or more from the outer surface of said ~~metallic component~~substrate.

30. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]103~~ having a final hardness of about 15 GPa or more.

31. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]103~~ having a final hardness of about 20 GPa or more.

32. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]103~~ having a final hardness of about 25 GPa or more.

33. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]103~~ wherein said final coefficient of friction is about 0.3 or less.

34. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]103~~ wherein said final coefficient of friction is about 0.2 or less.

35. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]103~~ wherein said final coefficient of friction is about 0.1 or less.

36. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]101~~ wherein said ~~outer surface~~substrate comprises a chromium content and ~~said sufficient quantity~~comprises from about 10 atomic % to about 40 atomic % F in relation to the chromium content.

37. (Currently amended) The ~~substrate~~metallic component of claim ~~[[2]]101~~ wherein said ~~outer surface~~substrate comprises a chromium content and ~~said sufficient quantity~~comprises about 25 atomic % F in relation to the chromium content.

38. (Currently amended) The substratemetallic component of claim [[3]]103 comprising ~~chromium~~ Schromium-X molecules to a depth of 50 nm or more from the outer surface of said chromium alloy substrate.

39. (Currently amended) The substratemetallic component of claim [[3]]103 comprising ~~chromium~~ Schromium-X molecules to a depth of 150 nm or more from the outer surface of said chromium alloy substrate.

40. (Currently amended) The substratemetallic component of claim [[3]]103 comprising ~~chromium~~ Schromium-X molecules to a depth of 250 nm or more from the outer surface of said chromium alloy substrate.

41. (Currently amended) The substratemetallic component of claim [[3]]102 having a final hardness of about 15 GPa or more.

42. (Currently amended) The substratemetallic component of claim [[3]]102 having a final hardness of about 20 GPa or more.

43. (Currently amended) The substratemetallic component of claim [[3]]102 having a final hardness of about 25 GPa or more.

44. (Currently amended) The substratemetallic component of claim [[3]]102 wherein said final coefficient of friction is about 0.3 or less.

45. (Currently amended) The substratemetallic component of claim [[3]]102 wherein said final coefficient of friction is about 0.2 or less.

46. (Currently amended) The substratemetallic component of claim [[3]]102 wherein said final coefficient of friction is about 0.1 or less.

47. (Currently amended) The substratemetallic component of claim 41 wherein said final coefficient of friction is about 0.3 or less.

48. (Currently amended) The substratemetallic component of claim 41 wherein said final coefficient of friction is about 0.2 or less.

49. (Currently amended) The substratemetallic component of claim 41 wherein said final coefficient of friction is about 0.1 or less.

50. (Currently amended) The substratemetallic component of claim 42 wherein said final coefficient of friction is about 0.3 or less.

51. (Currently amended) The substratemetallic component of claim 42 wherein said final coefficient of friction is about 0.2 or less.

52. (Currently amended) The ~~substrate~~metallic component of claim 42 wherein said final coefficient of friction is about 0.1 or less.

53. (Currently amended) The ~~substrate~~metallic component of claim 43 wherein said final coefficient of friction is about 0.3 or less.

54. (Currently amended) The ~~substrate~~metallic component of claim 43 wherein said final coefficient of friction is about 0.2 or less.

55. (Currently amended) The ~~substrate~~metallic component of claim 43 wherein said final coefficient of friction is about 0.1 or less.

56. (Currently amended) The ~~substrate~~metallic component of claim ~~[[3]]102~~ wherein said ~~substrate~~outer surface comprises a chromium content and ~~said sufficient quantity comprises~~ from about 10 atomic % to about 40 atomic % S in relation to the chromium content.

57. (Currently amended) The ~~substrate~~metallic component of claim ~~[[3]]102~~ wherein said ~~substrate~~outer surface comprises a chromium content and ~~said sufficient quantity comprises~~ about 25 atomic % S in relation to the chromium content.

58. (Canceled).

59. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ wherein said gradient further comprises chromium carbide molecules.

60. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ comprising chromium-O molecules to a depth of 50 nm or more from the outer surface of said metallic substrate.

61. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ comprising chromium-O molecules to a depth of 150 nm or more from the outer surface of said metallic substrate.

62. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ comprising chromium-O molecules to a depth of 250 nm or more from the outer surface of said metallic substrate.

63. (Currently amended) The ~~substrate~~metallic component of claim 59 comprising chromium-O molecules to a depth of 50 nm or more from the outer surface of said metallic substrate.

64. (Currently amended) The ~~substrate~~metallic component of claim 59 comprising chromium-O molecules to a depth of 150 nm or more from the outer surface of said metallic substrate.

65. (Currently amended) The ~~substrate~~metallic component of claim 59 comprising chromium-O molecules to a depth of 250 nm or more from the outer surface of said metallic substrate.

66. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ having a final hardness of about 15 GPa or more.

67. (Currently amended) The ~~substrate~~metallic component of claim 59 having a final hardness of about 15 GPa or more.

68. (Currently amended) The ~~substrate~~metallic component of claim ~~[[65]]104~~ having a final hardness of about 15 GPa or more.

69. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ having a final hardness of about 20 GPa or more.

70. (Currently amended) The ~~substrate~~metallic component of claim 59 having a final hardness of about 20 GPa or more.

71. (Currently amended) The ~~substrate~~metallic component of claim ~~[[65]]104~~ having a final hardness of about 20 GPa or more.

72. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ having a final hardness of about 25 GPa or more.

73. (Currently amended) The ~~substrate~~metallic component of claim 59 having a final hardness of about 25 GPa or more.

74. (Currently amended) The ~~substrate~~metallic component of claim ~~[[65]]104~~ having a final hardness of about 25 GPa or more.

75. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ wherein said final coefficient of friction is about 0.3 or less.

76. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ wherein said final coefficient of friction is about 0.2 or less.

77. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]106~~ wherein said final coefficient of friction is about 0.1 or less.

78. (Currently amended) The ~~substrate~~metallic component of claim 59 wherein said final coefficient of friction is about 0.3 or less.

79. (Currently amended) The ~~substrate~~metallic component of claim 59 wherein said final coefficient of friction is about 0.2 or less.

80. (Currently amended) The ~~substrate~~metallic component of claim 59 wherein said final coefficient of friction is about 0.1 or less.

81. (Currently amended) The ~~substrate~~metallic component of claim ~~[[65]]1104~~ wherein said final coefficient of friction is about 0.3 or less.

82. (Currently amended) The ~~substrate~~metallic component of claim ~~[[65]]1104~~ wherein said final coefficient of friction is about 0.2 or less.

83. (Currently amended) The ~~substrate~~metallic component of claim ~~[[65]]1104~~ wherein said final coefficient of friction is about 0.1 or less.

84. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]1106~~ wherein said ~~substrate~~outer surface comprises a chromium content and ~~said sufficient quantity comprises from about 10 atomic % to about 40 atomic % oxygen in relation to the chromium content.~~

85. (Currently amended) The ~~substrate~~metallic component of claim ~~[[58]]1106~~ wherein said ~~substrate~~outer surface comprises a chromium content and ~~sufficient quantity comprises about 25 atomic % oxygen in relation to the chromium content.~~

86. (Canceled).

87. (Currently amended) The ~~chromium alloy substrate~~metallic component of claim ~~[[86]]166~~ wherein said gradient further comprises chromium carbide molecules.

88.-89. (Canceled).

90. (Currently amended) The ~~substrate~~metallic component of claim ~~[[89]]181~~ wherein said gradient further comprises chromium carbide molecules.

91. (Canceled).

92. (Currently amended) The ~~substrate~~metallic component of claim ~~[[89]]181~~ comprising an automotive component.

93. (Currently amended) The ~~substrate~~metallic component of claim ~~[[89]]1106~~ comprising an aeronautical component.

94. (Currently amended) The ~~substrate~~metallic component of claim ~~[[89]]1106~~ comprising a journal bearing.

95. (Currently amended) The ~~substrate~~metallic component of claim ~~[[89]]1106~~ comprising a tool for injection molding of filled polymers.

96. (Currently amended) The ~~substrate~~metallic component of claim ~~[[89]]1106~~ wherein said tool is selected from the group consisting of a plated mold and a runner block.

97. (Currently amended) The ~~substrate~~metallic component of claim ~~[[94]]1106~~ comprising a medical implant.

98. (Currently amended) The ~~medical implant~~metallic component of claim 97 wherein said gradient further comprises chromium carbide molecules.

99. (Currently amended) The ~~medical implant~~metallic component of claim 97 comprising a total joint replacement.

100. (Currently amended) The ~~medical implant~~metallic component of claim 98 comprising a total joint replacement.

101. (New) A metallic component comprising chromium and a surface comprising a gradient from inside to outside, wherein the gradient comprises (a) substrate molecules, grading to (b) a mixture of said substrate molecules and chromium-F molecules, grading to (c) an outer surface comprising a sufficient quantity of said chromium-F molecules to produce a final coefficient of friction in an unlubricated condition against a steel counterface less than a virgin coefficient of friction of said surface in the absence of said gradient.

102. (New) A metallic component comprising chromium and a surface comprising a gradient from inside to outside, wherein the gradient comprises (a) substrate molecules, grading to (b) a mixture of said substrate molecules and substrate-S molecules, grading to (c) an outer surface comprising a sufficient quantity of said chromium-S molecules to produce a final coefficient of friction in an unlubricated condition against a steel counterface that is less than a virgin coefficient of friction of said surface in the absence of said gradient.

103. (New) A metallic component comprising:

a chromium alloy substrate other than stainless steel;

wherein a surface of said chromium alloy substrate comprises a gradient from inside to outside comprising (a) substrate molecules, grading to (b) a mixture of said substrate molecules and chromium-X, grading to (c) an outer surface comprising a

sufficient quantity of said chromium-X molecules to produce a final coefficient of friction in an unlubricated condition against a steel counterface that is less than a virgin coefficient of friction of said surface in the absence of said gradient; wherein X is selected from the group consisting of fluorine (F), oxygen (O), and sulfur (S).

104. (New) A metallic component comprising:

a chromium alloy substrate other than stainless steel;

wherein a surface of said chromium alloy substrate comprises a gradient from inside to outside comprising (a) substrate molecules, grading to (b) a mixture comprising said substrate molecules and chromium-O molecules, grading to (c) an outer surface comprising a sufficient quantity of said chromium-O molecules to produce a final coefficient of friction in an unlubricated condition against a steel counterface that is less than a virgin coefficient of friction of said surface in the absence of said gradient.

105. (New) A metallic component comprising:

a metallic substrate comprising a chromium coating;

wherein a surface of said metallic substrate comprises a gradient from inside to outside comprising (a) substrate molecules, grading to (b) a mixture comprising substrate molecules and chromium-X molecules, grading to (c) an outer surface comprising a sufficient quantity of said chromium-X molecules to produce a final coefficient of friction in an unlubricated condition against a steel counterface that is less than a virgin coefficient of friction of said surface in the absence of said gradient; wherein X is selected from the group consisting of fluorine (F), oxygen (O), and sulfur (S).

106. (New) A metallic component comprising:

a metallic substrate comprising a chromium coating;

wherein a surface of said metallic substrate comprises a gradient from inside to outside comprising (a) substrate molecules grading to (b) a mixture comprising substrate molecules and chromium-O molecules, grading to (c) an outer surface comprising a sufficient quantity of said chromium-O molecules to produce a final coefficient

of friction in an unlubricated condition against a steel counterface that is less than a virgin coefficient of friction of said surface in the absence of said gradient.

107. (New) The metallic component of claim 103 selected from the group consisting of an automotive component, an aeronautical component, a journal bearing, a tool for injection molding of filled polymers, a plated mold, a runner block, and a medical implant.

108. (New) The metallic component of claim 103 comprising a medical implant.

109. (New) The metallic component of claim 103 comprising a total joint replacement.